

# THE INVENTION OF TYPOGRAPHY

# **The Project Gutenberg eBook of The Invention of Typography, by Frederick W. Hamilton**

This eBook is for the use of anyone anywhere in the United States and most other parts of the world at no cost and with almost no restrictions whatsoever. You may copy it, give it away or re-use it under the terms of the Project Gutenberg License included with this eBook or online at [www.gutenberg.org](http://www.gutenberg.org). If you are not located in the United States, you will have to check the laws of the country where you are located before using this eBook.

Title: The Invention of Typography

A Brief Sketch of the Invention of Printing and How it Came About

Author: Frederick W. Hamilton

Release Date: February 22, 2022 [eBook #67471]

Language: English

Produced by: Richard Tonsing, Barbara Tozier, Bill Tozier, and the  
Online Distributed Proofreading Team at <https://www.pgdp.net>

\*\*\* START OF THE PROJECT GUTENBERG EBOOK THE  
INVENTION OF TYPOGRAPHY \*\*\*

## **Transcriber's Note:**

The cover image was created by the transcriber and is placed in the public domain.

TYPOGRAPHIC TECHNICAL SERIES FOR APPRENTICES—PART  
VIII, No. 50

**THE INVENTION OF  
TYPOGRAPHY  
A BRIEF SKETCH OF THE INVENTION  
OF PRINTING AND HOW IT CAME  
ABOUT**

BY  
FREDERICK W. HAMILTON, LL.D.  
EDUCATION DIRECTOR  
UNITED TYPOTHETAE OF AMERICA



PUBLISHED BY THE COMMITTEE ON EDUCATION  
UNITED TYPOTHETAE OF AMERICA  
1918

Copyright, 1918  
United Typothetae of America  
Chicago, Ill.

Composition and electrotypes contributed by  
Evans-Winter-Hebb, Inc.  
Detroit

## **PREFACE**

The writer of this book makes no claim to original investigation. The materials for such investigation do not exist to any considerable extent in this country. The results of such an investigation would form a book not suited to this series.

The writer has attempted to set forth briefly the conditions which brought about the invention of printing and to present the main lines of discussion concerning the inventor. He has consulted with some care a considerable number of authorities and has endeavored to present the results in comprehensive shape.

The writer believes that the history of any particular event is a part of the general history of the time in which it occurred. He has, therefore, endeavored throughout the historical portion of this series to indicate the general historic background of all particular historical events sufficiently to set these particular events in their relations to what was going on at the time in the world generally.

In addition to the supplementary reading indicated in the several volumes which follow, the writer ventures to hope that the students will familiarize themselves with some good general text book on modern history.

# **CONTENTS**



INTRODUCTION	<a href="#">7</a>
--------------	-------------------

## CHAPTER I

CONDITIONS IN THE MIDDLE OF THE FIFTEENTH CENTURY	<a href="#">11</a>
---	--------------------

## CHAPTER II

STEPS TOWARD TYPOGRAPHY	<a href="#">17</a>
-------------------------	--------------------

## CHAPTER III

CLAIMS TO THE INVENTION	<a href="#">26</a>
-------------------------	--------------------

## CHAPTER IV

THE INVENTION	<a href="#">32</a>
---------------	--------------------

## CHAPTER V

MATERIALS AND METHODS OF THE FIRST PRINTERS	<a href="#">47</a>
---	--------------------

SUPPLEMENTARY READING	<a href="#">52</a>
-----------------------	--------------------

REVIEW QUESTIONS	<a href="#">53</a>
------------------	--------------------



# THE INVENTION OF PRINTING

## INTRODUCTION

Many persons and many places have claimed the honor of the invention of typographic printing. That these conflicting claims should be made is the most natural thing in the world. Almost all epoch-making inventions and discoveries are of more or less doubtful origin. The reason for this is that such discoveries grow out of conditions and needs. At the time appointed they appear as inevitably as the blossom on the plant. Very likely they appear in several places at once. Often, also like the blossoms on a plant, only one produces what the gardener calls a "set," that is, a fruit which ripens and matures seed for reproduction. The state of human knowledge or the pressure of human need may be such that many students are at work at the same time upon problems which seem to demand solution. In this way the theory of evolution, whose adoption, revolutionizing as it did the entire system of human thinking, was the most important event of the nineteenth century, was independently discovered by Darwin and Wallace, who were working at the same time along independent lines of investigation.

The advance in surgery and a keen appreciation of the suffering under operation which made many operations impossible led to the simultaneous discovery of anesthesia by at least two investigators, William T. G. Morton and Dr. Charles T. Jackson. Investigation of

the uses of electricity led to the independent invention of the telephone by Bell and Dolbear. It is certain that occasional European sailors found their way to the western hemisphere through several centuries before Columbus made his famous voyage. These are only a few of the most notable instances of such disputed or independent discoveries.

In some cases the judgment of the world has probably awarded the glory incorrectly. In other cases the glory has gone, perhaps justly, to that one of two or more discoverers who succeeded in making his invention practically or commercially useful. For instance, while Morton was probably not the original discoverer of anesthesia, it was he who made it practically useful in surgical operations, and while there appears to be no question that Dolbear antedated Bell in the discovery of the telephone, Dolbear's interest was purely scientific while Bell gave the telephone to commerce.

The same conditions of doubt and obscurity surround the invention of printing. As we shall later see, more at length, the invention of printing was a development of existing processes called for by the needs of the time and arising out of the conditions of the time. It was inevitable that typographic printing should be discovered by somebody in the middle of the fifteenth century. So far as the evidence at our command shows, the art was not invented in several places at the same time, but was developed by one man out of familiar processes. For some reason which is not now clear, the work of this man, though considerable in extent, appears to have been without immediate direct results of much importance. At a very early stage the invention was seized upon by another who, with his associates, established a center from which the art steadily grew and developed. So important in its practical results was the work of this man and his associates that he has been for centuries hailed as the inventor of printing. It is needless to say that this man was John Gutenberg.

In the judgment of the present writer, however, the claim that Gutenberg invented typographic printing cannot be maintained. The discussion has been long and sometimes bitter. The arguments, or at least many of them, are of a highly technical nature and many minor points yet remain to be cleared up. In a book of this sort it would be obviously out of place to go at length into the details of the argument.

The writer, moreover, lays no claim to original investigation. An attempt will be made in the following pages to show the conditions out of which the discovery arose, to tell the story of the invention, to place the credit both of actual invention and practical application where it belongs, and to bring out certain points which may be interesting about the work of the very earliest printers.

In taking the position which he does with regard to the invention the writer regrets that he is obliged to dissent from the conclusions of De Vinne. In his *Invention of Printing*, De Vinne ably maintains the claims of Gutenberg. No one can be more ready than the present writer to pay homage to the greatness of De Vinne and to acknowledge the immense debt which the printers of America owe to him. His series of historical and critical essays on the practice of typography are still unapproachable. In spite of the changes which have taken place in the years since they were written, their substance is not affected excepting in some minor and unimportant details. They are still supreme authority in their field. De Vinne's historical work was also of great importance and for the most part may still be accepted without question. Under these circumstances it is only natural that the conclusions of De Vinne should carry great weight and that the great body of American printers should have accepted the Gutenberg attribution without question upon De Vinne's authority.

It must be remembered, however, that De Vinne's work was written nearly forty years ago. Just before he wrote, Dr. Van der Linde had published a voluminous work in which the theory of the Gutenberg invention was supported at great length and with great show of scholarship. This was later followed by other volumes of similar purport. For a considerable time Van der Linde's books were considered as settling the question. De Vinne, as may clearly be seen from his preface, wrote under the spell of Van der Linde's influence. Later investigations, however, have shown that Van der Linde's scholarship was largely show, that he was not only uncritical but unskillful in his use of authorities, and that his voluminous works are written with the sole purpose of bolstering up a preconceived theory. Most of this investigation had not been conducted when De Vinne wrote. The discussion cannot be said to have swung the balance of probability to the other side until after De Vinne's literary activities

ceased. The knowledge we now possess, however, has forced the present writer to abandon the De Vinne position and to base the historical part of this series of text-books on acceptance of the belief that typographic printing was discovered by Coster, of Haarlem, in Holland.

# **CHAPTER I**

## **CONDITIONS IN THE MIDDLE OF THE FIFTEENTH CENTURY**

As was briefly indicated in the preceding volume in this series, the conditions existing in the world of letters at the middle of the fifteenth century were such as to demand imperatively some new method of making books. The slow march of civilization had gone on with many setbacks and interruptions through the centuries, but was now proceeding with a swiftness hitherto unknown. The demands of the human mind were pressing hard against the physical boundaries to progress created by the methods of book-making then in use. It must be remembered that men were still making books just as they had done for nearly two thousand years. A vast store of knowledge had been accumulated and additions were being made with tremendous rapidity, but there was no adequate means of getting this knowledge before the people. At the same time there were more people intensely eager for knowledge than ever before.

It is worth while to stop for a moment to consider the conditions of the period. The Hundred Years' War between France and England, which had paralyzed the energies of a divided France and had exhausted the powers of England in useless attempts at an impossible conquest, had at last come to an end. The English had withdrawn to their own island. They had given up the dreams of a continental empire which had danced before their eyes ever since William of Normandy, in 1066, had added England to his possessions. In reading English history we are liable to forget that during a great part, if not the whole, of the four hundred years succeeding the Conquest, the English kings had considered their continental possessions the more important, regarding the little

island which they shared with the Scotch, then an independent nation, as a sort of colonial possession. It is true that they maintained their capitals there and took their titles thence, because in England they were kings, whereas they governed their broad possessions on the continent as dukes or counts only. From the time of Henry V they had claimed to be kings of France. Now these continental ambitions were definitely given up and England was free to develop her own nationality, and a much more vigorous national life immediately began.

The same events mark an era in the development of France. Free from the horrors of war and the dread of another conquest, a new opportunity was given for the development of the arts of peace.

Italy was still divided into a great number of independent states whose quarrels and changing alliances make the Italian history of the period extremely difficult to study on its political side. There had, however, developed in Italy a group of strong rulers who governed states of respectable size and kept them for considerable periods in comparative stability. The Italian states had rallied more quickly from the barbarian invasions which overthrew the Roman Empire than the rest of Europe and their progress in civilization had been very remarkable when one considers the civil wars and wars between small states which had been almost continuous.

For the most part Germany had lagged far behind the rest of Europe in the development of civilization. The greater part of it, however, was now in a fairly stable political condition and many of the German states had become important centers of learning. This was especially true of western and southern Germany, where the influence of Rome had been strongest and where the influence of France and Italy had been most felt.

Much of Spain was still in the hands of the Moors, who were in many respects more civilized than their Christian neighbors. Portugal was enlightened and advanced.

The great schism known as the Babylonish Captivity which had rent the Catholic Church in twain, with rival popes ruling at Rome and Avignon, had come to an end, and for the time being the unity of Christendom was undisturbed.

The political conditions of Europe were thus more favorable than they had been for a long time for the development of the intellectual life. They were still far from ideal and there were many dark days in store, but the bad old times were never fully to come back.

This political condition, however, was only a background for the revival of intellectual activity known as the Renaissance which distinguishes this remarkable period.

This movement may perhaps be said to have begun with Petrarch, the Italian poet, philosopher, and student, who died in 1374. By the middle of the fifteenth century, however, many men had appeared in the world of letters whose names are famous for all time. These great thinkers and writers revived the study of the ancient languages, recast the study of philosophy, and even ventured to discuss the fundamentals of religion. In so doing they not only revived the ancient learning, but started a new one.

New universities sprang up, among them Erfurt in 1392, Leipsic in 1409, St. Andrews, in Edinburgh, in 1411, Louvain in 1426. The revival of the study of great literature in Italy may be said to have begun about 1400. About 1450, there were many eminent Greek scholars and their enthusiasm for Greek literature had led to the revival of the philosophy of Plato.

The revival of interest in the art of the ancients, classic literature, and the philosophy of Plato brought about the great advance of modern art which marked the second half of the century, Perugino, the teacher of Raphael, being born in 1446.

All this intellectual activity stirred a new spirit of adventure. Just as the men whose intellectual energies had been absorbed in the petty quarrels of church and state now devoted themselves to constructive thinking, so those whose physical energies had been devoted to the constant succession of small wars of which we have spoken now gave themselves to exploration. By the middle of the century important discoveries had been made by the exploring expeditions sent out by the Portuguese prince, Henry the Navigator. The known world was to be doubled in size by the voyage of Columbus before the end of the century.

It is easy to see that all this meant the creation of many books. Learning without books is a manifest impossibility. There was a



renewed interest in the old books and a great call for copies of them. All this new learning and discovery required books for record and for dissemination. It is true there were many more books than there had been formerly and many more were being made, but the possibility of supply was hopelessly behind the demand. Great libraries were being formed and many individuals had remarkable collections of books. Some of these libraries still exist, the best known probably being the library of the Vatican, at Rome, which was started in 1447. The trade of book-making had long since outgrown the monastery. As we saw in the preceding volume, practically all of the book-making of the so-called Dark Ages was in the monasteries and much was still done there, but there was now in existence a regularly organized trade of copyists. No really good book of this period was complete without its ornamental capitals, pictures, and other embellishments. These adornments, or illuminations, as they were called, extended in some cases to every page of a book. They were not generally made by the men who did the copying or writing of the text, but by a class of specially trained men who were called illuminators.

Clearly the shortcomings of the manuscript books are very evident. First and foremost must be placed the absolute impossibility of making by the laborious process of writing out by hand anything like the number of books required to meet the demand. Either some new method of making books must be devised or the new learning and the new civilization were to be strangled at birth. Moreover, the manuscript books were necessarily very costly and they were also very inaccurate. Any one who has had any experience in the hand-copying of large amounts of manuscript will see how impossible it is to avoid errors, even with the most careful checking over. It is not probable that any two copies of any manuscript book were ever exactly alike. It is true that the invention of printing did not automatically remove errors. Indeed errors and inaccuracies, very common in the early books, are far from unknown at present, but at any rate all the copies of one edition are alike and errors may be corrected either in subsequent editions or by the insertion of errata in the printed book.

Not only was the time ripe for the invention of a new method of book-making, but the materials were ready with the vital exception

of type, and that was within a step of discovery. The materials are paper, ink, presses, and type. Paper is supposed to have been invented by the Chinese about the end of the first century A. D., and to have been more or less known in the East for a long time before the knowledge of it was brought to Europe. The Arabs conquered Samarkand in 751, and from this conquest it is supposed that the knowledge of paper and paper-making came to Europe by way of Spain, the greater part of which was then in the hands of the Moors, who were themselves Arabs. As early as the eleventh century there were paper mills at Valencia, Xativa, and other Moorish towns in Spain. From Spain the art of paper-making spread to Italy where we know that there was a paper mill at Fabriano before 1340, and to France where there was a mill at Troyes about the same time. Not long after we find paper-making at Nuremberg. By the middle of the century paper was familiar throughout Europe, but the use of it was not extensive. The paper of that time did not lend itself readily to writing and the makers of the manuscripts preferred the use of parchment.

Obviously, printing can not be done with writing ink. Very different qualities are necessary for the two arts, but as early as the beginning of the century special inks were being made for printing from blocks. Those inks were not exactly like those soon to be used for printing from type, but they were near enough in their general character to indicate the improvements which were needed to produce a true printer's ink. Who invented these inks is not known, but it is generally supposed that they were invented by artists who were accustomed to the handling of color and pigments. The invention has been attributed by some to an unknown Italian painter, by others to Hubert Van Eyck, a great Dutch painter of the period. It is not probable, however, that the invention, if it can be said to be the invention of an individual, can ever be traced to its author.

The press needed was only an adaptation of a very simple machine in common use for many different purposes. The use of the press in squeezing grapes for wine, in molding cheese and squeezing out the whey, and for a great number of other purposes was so common that the problem of the exertion of pressure was already solved. Everything was ready but the type, and when one sees how far men

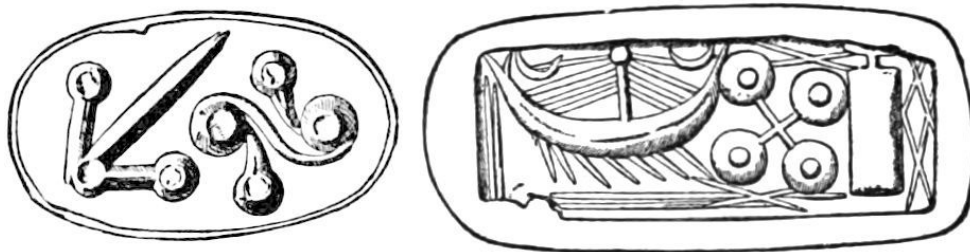
had gone toward the use of type one wonders that the invention was not made long before it really occurred. Probably it was only waiting for the imperious demand of necessity to spur some one to the making of the necessary experiments.

## CHAPTER II

### STEPS TOWARD TYPOGRAPHY

Typographic printing, briefly defined, is printing from movable types. That is to say, it is the impression of words upon paper or other material by the use of movable types which have first been covered with ink, the inked face of the type transferring the characters to paper and producing the printed page. This includes any printing from a type form in which movable cuts may be locked up with the type, or in some cases may be used alone on the press as in printing full-page illustrations. It was this process which was invented in the middle of the fifteenth century.

The practice of making impressions upon various substances by the use of various devices prepared for that purpose goes back to the dawn of civilization. The earliest device of this sort appears to have been a seal used for impressing a device which might stand for a personal signature or indicate the official authentication of a document or other public act. These seals are found in great numbers among the most ancient remains. Two early ones from the island of Crete are shown herewith.



Ancient Seals from Crete

There are also in existence many ancient Babylonian seals. These seals were of various sorts. Sometimes the design was cut in the flat surface, leaving a raised impression when stamped upon wax, clay, or some other yielding substance. Such seals are said to be made in intaglio. Sometimes the surface is cut away leaving the designs standing out, thus making a depressed mark in the soft surface. These seals are said to be cut in relief. Sometimes the surface of the seal, instead of being flat, was a cylinder rolling on a pivot so that the impression of whichever sort it might be was made by rolling the seal with pressure over the soft substance. It is said that the Romans came very near the discovery of typographic printing. The Roman potters stamped their names letter by letter in the soft clay of their ware before it was fired. The use of dies for stamping coins and metal seals is also very ancient.

The Assyrians not only inscribed their records upon cylinders of soft clay by pressing a sharp stick into them to make the curious wedge-shaped characters of their alphabet, but it is evident that they carved rather long inscriptions on plates, probably of wood, and transferred these to bricks by pressure. The illustration shows an Assyrian stamped brick of this sort. Wherever we touch the history of civilized man we find some form of printing by the use of a seal, a stamp, or even a single letter. Some manuscripts long before the middle of the fifteenth century seem to have had

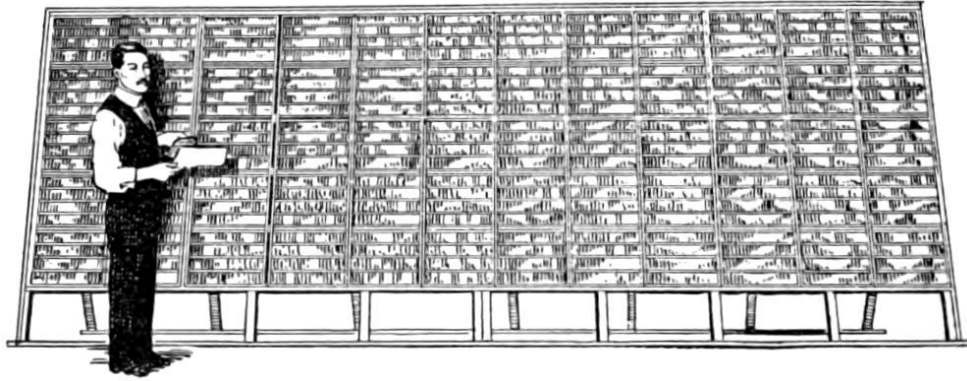


Assyrian Clay Tablet

the initial letters put in by means of stamps which were applied either by heavy hand pressure or by the blow of a mallet. These initial letters certainly show the use of color in making the impression. It is probable that such use of color was early thought of as a means of making the impression of the seal more distinct and dispensing with the pressure necessary to force the seal into the substance of the parchment, papyrus, or paper which was being used. Thus through the ages we slowly grow toward a more varied and extensive use of these primitive methods of printing.

If we turn to Asia we find that the Chinese and their neighbors, the Japanese and the Koreans, anticipated Europe by many centuries in printing, as well as in other arts. The Chinese appear to have hit upon the device of multiplying books by cutting all the characters needed for a page on a block of wood and then applying the inked block to the paper as early as the sixth century, A. D. Books printed by this process, generally known as block books, were common among the Chinese as early as the tenth century. The Japanese were using blocks for printing before the year 800, A. D. The British Museum contains a Korean book apparently printed from movable types which is supposed to date as far back as 1338.

All this is very interesting, but there is not the slightest evidence that it had any effect whatever on the development of printing in Europe. Chinese and Japanese typography is not a development from their own block books, but is a recent importation from Europe. The Chinese characters, which are also used by the Japanese, are not letters but ideograms. Instead of having a few characters representing the fundamental sounds, by the combination of which words are expressed, they have a vast number of characters, many thousands of them. These characters represent to the mind an idea as a whole. They may be vocalized as a word or a syllable, but not as a single sound out of a combination of which syllables and words may be built up. It was quite practicable to carve the characters representing a page on a block and print from that, but it was clearly not practicable to make movable types representing all these almost innumerable characters. Typographic printing is possible only through the selection for common use of a small number of the most essential characters and using them as the basis of a working vocabulary. The introduction of typography represents probably a step toward the reduction of this great number of characters to a comparatively small number representing the sounds or syllables most in use. A font of Chinese type is a fearful and wonderful thing, and learning the case for Chinese composition is a task which very few western people would care to undertake.



Modern Chinese Type Case

The accompanying illustration shows a Chinese compositor at his case in the Lakeside Press, Chicago. The “frame” contains one complete font of approximately seven thousand characters. It is about sixteen feet long by five feet high, and is made up of a number of smaller “cases” approximately twelve by fifteen inches over all, each holding about two hundred and forty characters. This font is approximately ten-point body according to United States standards. It required an entire month to “lay the cases.” It requires about ten thousand characters to print a Chinese book, but some of them are made by combinations of primary characters, so that the seven thousand in the case will do the work.

During the centuries previous to the invention of printing the number of persons who could read was very small. The common people, farmers, soldiers, workmen, and the like, received but little instruction outside the immediate necessities of their lives. That little was largely by word of mouth reinforced by symbol and picture or statue. In those days the churches were the poor man’s schools and libraries. The Bible stories were told him by the priests and nuns and by the old men and women. The churches were elaborately ornamented with statues, stained glass windows, brasses, paintings, and carvings. Many of these painted or sculptured representations were conventionalized. If one saw a figure with a great key in his hand, no matter what the costume of the figure or the design of the face, he knew it was St. Peter. If he saw another figure with a book and a sword, he knew that it was St. Paul, and so on. He saw the sacrifice of Isaac, the Massacre of the Innocents, the Crucifixion, the Martyrdom of St. Stephen, and all the other Bible stories visibly



expressed. He saw the statues of kings and bishops and was told the meaning of the scenes in which these and other characters were represented in picture or sculpture. He thus read and reread the statues, stained glass windows, and sculptures of his church as we read and reread our Bibles and our histories. Many carvings and pictures were put into the churches which we should today consider entirely out of place. Caricature began here as well as religious and historical instruction. We find represented scenes which recall the current fables of the time and sometimes pictures of scenes ridiculous or even indecent, according to modern ideas, which satirized the vices and faults of men and women while they warned against them.

By and by the desire came to bring this instruction into the homes of the people who were too poor to have paintings and carvings of their own. This desire was met by the production of what is known as image prints. The picture of some saint was carved on a piece of wood and from this block, or more properly plate, because the pictures were carved on the side and not the end of a flat piece of wood, an inked impression was made on parchment or paper. This process seems to have come in use some time in the fourteenth century. By the beginning of the fifteenth it was fairly common. The earliest dated woodcut of this sort, bearing the date 1423, is shown herewith. It is interesting not only as being the oldest dated work of this sort, but as being typical of the way in which these pictures were conceived and executed. It represents St. Christopher. The saint is shown fording the river with the Child Jesus on his shoulder and represents the entire legend of St. Christopher, the Christ Bearer.



Reduced Facsimile of Early Wood-  
cut

At first these images appeared upon single sheets bearing only the picture. Later, words were carved upon the block in addition to the picture, giving us on one page the combination of picture and text. Very probably the owner could not read the inscription, but he could be told what it meant and the very form of it would recall to his mind the words which he had learned.

From this single picture there were two lines of development. One was the binding up of several pages of such pictures and texts into a book. Each page was printed from a single block and the result was a block book. Of these there were two especially famous and often printed, The Biblia Pauperum, or Poor Man's Bible, and the Speculum Humani Salvationis, or Mirror of Human Salvation. The Poor Man's Bible, of course, was a collection of prints recalling the biblical stories. The Mirror went further afield and showed pictures representing moral teaching. Great numbers of these books were printed and circulated, especially in Holland and Germany.

The other development was the printing of whole pages of text. Certain books were in great demand. The advantage of being able to reproduce them quickly and cheaply was obvious. The two best known are alphabet books for beginners called Abecedaria, or

Abecederium in the singular, and the elementary Latin grammars abstracted from the works of an old Latin grammarian named Donatus. These grammars were commonly called Donatuses. These books, especially the school books, were printed mostly on vellum, partly because of its greater durability and partly because the use of paper was not yet common.

We have here the lines of development which led directly to the invention of typography. We have already mentioned books printed from plates with pictures without text, pictures with text, and text without pictures. What would be more natural than to cut off the part of the block containing the text and use the picture alone, or to combine the text with text cut from another block or with another picture from which the text had been removed? If we could do this why could we not cut out a single word or a single letter and why not make a considerable number of these single letters and combine them into words? If parts of two or more blocks were to be used for the same picture, they must be fastened together in some way, or as we should say today the form must be locked up. Why could not separate letters be fastened together in the same way so that we could print anything we wanted by the simple process of putting together the necessary letters in the proper relation? As we shall see presently, this is exactly what happened, and the invention of printing thus considered is the most natural thing in the world.

Before passing to the next phase of the discovery, a word should be said about playing cards. Until recently playing cards were considered as having a place in this development which they probably never occupied. Playing cards, like many other things good and bad, were invented in the East. They made their appearance in Europe somewhere about 1375 A. D. and by 1400 they had become popular. The first cards were hand painted which, of course, made them expensive and confined their use to the wealthy. A little later, however, they were painted by the use of stencils so that they could be produced cheaply and plentifully. Later still they were printed from blocks like the image prints and colored by hand. Color being essential to playing cards, the development thus outlined was the most natural. It has been supposed that the comparatively small playing card was first made and that the image print was derived from the playing card. There now seems no question that the process

was the other way about, as there are no printed playing cards known as early as the St. Christopher above referred to. The block-printed playing card seems to have been clearly an imitation of the image print, and not the image print an evolution from the playing card.

## **CHAPTER III**

### **CLAIMS TO THE INVENTION**

De Vinne mentions fifteen cities or towns as having been specified by as many different authors as the true birthplace of typography. The names of these are Augsburg, Basle, Bologna, Dordrecht, Feltre, Florence, Haarlem, Lubeck, Mainz, Nuremberg, Rome, Russeburg, Strasburg, Schelestadt, and Venice. The various authors assign to these towns the names of the following alleged inventors: Castoldi, Coster, Fust, Gensfleisch, Gresmund, Gutenberg, Hahn, Mentel, Jenson, Regiomontanus, Schoeffer, Pannartz and Sweynheym, and Louis de Vaelbaeske.

Of these claims there are only three which deserve any consideration whatever. The first of these claims, the alleged discovery at Avignon, is by far the most recent and may be quickly disposed of. In 1890 the Abbé Requin discovered five curious documents in the notarial records of Avignon, in southern France. These papers deal with the business dealings of the silversmith Procopius Waldfoghel with certain other persons regarding the art of writing artistically, instruction therein, and certain tools therefor. There are mentioned in these papers two steel alphabets in Latin, one iron alphabet in Hebrew, two iron frames, one steel screw, forty-eight forms of tin, and divers other forms belonging to the art of writing. There is also mention of instruments or tools of iron, steel, copper, latten, lead, tin, and wood for writing artistically. These documents date from 1444 and 1446, before Gutenberg had produced any results. On the evidence of these documents attempts have been made to show that printing was being done at Avignon several years before the earliest date that can be assigned to the 42-line Bible, the Letters of Indulgence, or even the somewhat doubtful Latin Grammar.

A careful study of the documents, however, hardly bears out this claim. It is said that the writing was to be done on “stuffs” (cloth), but nothing is said of paper, ink, or other materials needed for printing, and it is a stretch of the imagination to see punches and matrices in the iron and steel alphabets and the forty-eight forms.

The probability is that Waldfoghel cut letters of ornamental and artistic forms on dies to be used as initials and the like on manuscripts or on cloth and other materials and devised or borrowed a method of printing from them by the application of power through some sort of screw press. This is in harmony with much that we know to have been done at that time, but is quite apart from anything like typography as we are considering it.

The second is the so-called Coster legend. This story in its legendary form says that Lourens Janssoen Coster invented printing from the chance trifling of an idle hour. He is said to have been strolling in the woods near Haarlem one day and to have cut some pieces of birch bark in the form of letters. With some of these letters dipped in ink he made marks on parchment or paper and found that he could combine them and recombine them so as to make words and sentences. He then began experimenting in earnest. His first letters were carved out of wood, then he made them out of lead, and at last out of tin. Finding the ink used by the copyists unsatisfactory he invented an ink of more viscous kind better suited to the work in hand. The story runs that his new invention attracted much attention and that he made many books which he sold at good profit. The work grew beyond his personal capacity to do it and he took servants or apprentices. Among them was a young fellow named John. John had more brains than honesty, and one day while the family were at church John packed up the type and the matrices and left Haarlem. From Haarlem, the story goes on to say, he went to Mainz where he set up in business for himself and prospered exceedingly. It is from this act, says the story, that all the Mainz printing proceeded. In this form the story is obviously legendary. We shall examine it later in another connection when we shall see this point more clearly, some of the details being evidently introduced to fill the gaps in what may be regarded as history.

The third claim is the commonly accepted Gutenberg legend. Concerning Gutenberg himself we know very little, although

somewhat more than we know about Coster. What we do know of him rests almost entirely upon public registers and the records of law suits. No authentic record of his birth exists, but it is supposed to have taken place at Mainz about 1399. Mainz, like many other cities of the time, was a prey to internal disputes and as a result of some such political overturn Gutenberg's family went to Strasburg some time before 1430. In a legal document in existence at Strasburg we find mention of John Gensfleisch, otherwise known as Gutenberg, of Mainz. His name occurs in a proclamation issued in 1430 granting political amnesty to the Mainz exiles. In the same year he negotiated with the authorities of Mainz for a pension for his mother and in 1432 he was in Mainz. He next appears in the Strasburg court records in 1439, when he was defendant in a suit brought against him by his business partners. In these records are obscure references which have been interpreted as referring to printing. In the light of the clearer reference of later law suits it is not probable that this interpretation is correct.

Gutenberg was then, as for all his life, in financial difficulty. Whatever the outcome of the 1439 suit, he borrowed a hundred pounds in 1441 and in 1442 sold an annual income of four pounds for eighty pounds cash. The Strasburg tax books show that he was in arrears for taxes between 1436 and 1440. By some writers these financial difficulties are supposed to have arisen out of Gutenberg's devotion to his experiments in typography. It is more probable, however, that they were owing to lack of business ability and possibly to lack of business integrity. The shifts to which he had recourse in his financial difficulties run at times perilously near the line of dishonesty.

In 1448 Gutenberg was back in Mainz and again borrowing money. What happened next can best be read back from what is known as the Helmasperger document, a notarial instrument relating to a law suit which John Fust brought against Gutenberg in 1455. From this document it appears that about 1450, or slightly before, Gutenberg became acquainted with John Fust, who was a prosperous business man in Mainz. The two entered into a contract of partnership for five years. Fust was to advance 800 guilders to Gutenberg at six per cent interest for use in procuring tools and materials, said tools to remain mortgaged to Fust until the loan was paid. In addition Fust was to



advance to Gutenberg 300 guilders every year to provide for servant's wages, house rent, vellum, paper, ink, etc. In return Fust was to receive one half of the profits, but was to be responsible for no debts and was to take no personal part in the business.

It is reasonably clear from this contract that while Gutenberg had hopes in 1450, and we shall probably see later upon what they were founded, he had not even made the necessary tools for printing, much less printed anything. Things did not, however, go smoothly under the new partnership. Instead of Fust paying the eight hundred guilders at once, he spread the payments over two years. Gutenberg, on his part, did not find the three hundred guilders a year sufficient. Fust, therefore, proposed that instead of paying the three hundred guilders a year for the remaining three years of the partnership, he should pay eight hundred guilders down, and remit the interest on the first eight hundred guilders as an offset for the one hundred guilders which Gutenberg would lose under this modification of the original contract.

These arrangements seem to have been carried out but in 1455 the results were so unsatisfactory that Fust brought suit to recover the money advanced. The court decided at least in part in favor of Fust. Gutenberg was unable to return the money which the court awarded to Fust, and in consequence Fust took possession of the business and equipment. Gutenberg appears to have saved something out of the wreck and found a new financial backer in the person of Conrad Humery, a physician and town clerk of Mainz. To this new office are attributed a number of books and pamphlets, the most important one being a Catholicon, 1460, nearly eight hundred pages large folio. In 1462 the city of Mainz was besieged and sacked and the printing industry therein was broken up. In 1466, however, we find printing done in Eltville, a suburb of Mainz, with type which is supposed to have been Gutenberg's. As this was the birthplace of Gutenberg's mother and there was a family estate there it is quite probable that the Gutenberg-Humery office was set up in that place. In 1465 we find Gutenberg appointed one of the officers of the court of Adolph II, the militant prince-bishop who had captured and looted Mainz three years before. The patent states that this appointment is made on account of "agreeable and voluntary service rendered to us and

our bishopric.” This is the last we hear of Gutenberg except the record of his death in February, 1468.

In brief, this legend tells us that Gutenberg was for years a patient but disappointed seeker after an invention which he had dreamed of but could not make practical, that he finally succeeded only to be robbed of the fruits of his success by an unscrupulous money lender, that in his old age he began again with undaunted courage, struggling always against financial difficulties and always failing to make a wordly success of his great invention, reaping his only reward in the tardy favor of the prince-bishop. That Fust and his son-in-law, Schoeffer, did make a financial success of printing, and that further success was made by Bechtermüntz, who is said to have been a relative of Gutenberg and to have inherited type and material from his second shop, and that from Mainz as a center the art of printing spread over the civilized world are beyond question. These are the legends of the invention. Now let us see if we can find out what really happened.

## **CHAPTER IV**

### **THE INVENTION**

The study of the question of the invention of printing, like that of any other historical question, must deal with the examination of three classes of evidence or so many of them as may be available. These three classes of evidence, in order of their importance, are first, remains, second, contemporary documents, and third, documents or evidence of a later period. For example, there may be tradition widely current and running backward in literary form to within a hundred years of the death of the person referred to, that a certain king ruled in a certain country and did certain things. That is evidence of the third class. There may be extant contemporary works of travelers, histories of other countries, or even the published recollections of old men, which said that at a certain period that king lived and did certain things. That is evidence of the second class. There may be coins, official inscriptions, public documents, emanating directly from this king or even bearing his signature. This is evidence of the first class. This class of evidence is conclusive. The second class is strong, but not conclusive, the third class is very uncertain.

Now it happens that with regard to the invention of printing we have evidence of all three classes. All of it is conflicting, but the conflicts, it is to be noted, are mainly in the evidence of the third class. The evidence of the second class exists mainly in Mainz, but is not nearly as conclusive as has been supposed. Evidence of the first class comes entirely from Haarlem, and is there supported by one or two important pieces of evidence of the second class. With this brief introduction perhaps it will be easier to understand the argument which follows.

Of course, the material of the first class, namely, remains, would be the earliest known pieces of printing. If these pieces of printing were dated as books are today, they could not be questioned, but as they are not so dated, but must be placed by other evidence, they have been questioned. There exist, in whole or in part, forty-seven distinct pieces of printing each bearing evidence of being among the first pieces of printing produced. These forty-seven works in their present condition run all the way from an entire book to a fragment of a single page. A group of three or four of them may be identified by reference to officials whose official dates were known as being either in 1474 or immediately preceding it. This, however, does not date the whole group. These few specimens are much more advanced in their appearance and workmanship than the rest of the forty-seven. Several other editions of some at least of these better books appear in this interesting lot of remains. The other editions are of a much more primitive appearance, showing that the period covered by the forty-seven works ended not later than 1474.

Of these forty-seven works, forty-five are in Latin, which, as we know, was the language of schools, courts, and churches at this period in all nations. One, an edition of a book of which there are several editions in Latin, was in Dutch. One was in French. That these forty-seven books all came from Haarlem is pretty clearly shown by certain internal evidence. One of them is clearly placed in Holland by the fact that it was printed in Dutch. Nobody at the very outset of printing would print books in Dutch except a Dutchman. All the rest of the forty-seven are closely related to these, as is shown by the similarity but not identity of their types.

The earliest printers were imitators of the copyists. They made their pages look as much like a manuscript page as they could, not perhaps with intent to deceive, but because nothing else occurred to them. You will find that all the earliest types are modeled upon the handwriting current among the copyists of the place where the printing was done. Certainly these books did not come from Mainz. Nobody has ever claimed that they did. Almost equally certainly they did come from Holland and from Haarlem. The handwriting is the handwriting of the Haarlem copyists of the period. An attempt was made at one time to assign these books to Utrecht, but it is not only true that each country had its prevailing copyist's hand, but that each

important center had its own system variously developed in the local schools in which copying was taught. The Utrecht hand is not the Haarlem hand. The books resemble the Haarlem hand and not the Utrecht.

While the forty-seven books show a considerable number of varieties of type, the editions being identified by these type differences, all the type faces show a strong family resemblance. They are designed from a common model, but not at the same time, and consequently they show marked resemblances and marked differences. The question may be asked why the same printer should use eight or nine different fonts of type for only forty-seven books. The answer is found in the fact that type-making was as yet in an experimental stage and that durable material had not yet been found for that purpose. When we come to the discussion of evidence of another class we shall find confirmation of this. There is no evidence of the second or third class connecting early printing with any Dutch town except Haarlem. There is, however, important evidence of the other classes which does connect printing with Haarlem. There are not, however, forty-seven different works. Twenty of the forty-seven books are different editions of the *Donatus*, that is to say they are *Donatuses* showing such typographic differences as to show that no two of them could have been printed from the same type form. Four of them are editions of the *Speculum* and eight are different editions of the *Doctrinale*. The *Doctrinale* was a brief compend to Christian doctrine approved by the church and widely circulated among the faithful.

Nearly all of the fragments of these forty-seven books have been found in Haarlem or in the neighborhood. It is evident that the publications of this press, whatever its date, were locally sold and that neither its fame nor its product went far from the place of production.

Having thus shown the reasons for believing that these forty-seven pieces of early printing came from Haarlem, let us see what they have to say for themselves as to the time of their production. It has already been pointed out that a small group of the best of them dated themselves no later than 1474, as is shown by their contents. So far as the contents themselves are concerned we have nothing to date the others. There are certain things about the books themselves,

however, which show that their production must have begun long before 1474.

For one thing, there are twenty editions of the *Donatus*. We have no way of knowing how near together the editions were, but when we compare them with the editions of the *Donatus* later published we shall see that it is not unreasonable to suppose that they run back some thirty years. There were also four editions of the *Speculum* and eight editions of the *Doctrinale*. In each case the evidence of other printers shows that even one of the small editions usually published at that time lasted for a considerable period. The appearance of the books themselves bears out this conclusion. Good as the later ones are, they are inferior to Mainz workmanship of their period and the earlier ones are far inferior to Mainz workmanship of any period. They are not only without signatures, initial directors, hyphens, and catch words, all of which had come into use before 1474, but they show certain other remarkable peculiarities.

Many of these editions were printed on vellum, which is not in itself remarkable, as vellum continued to be used for a good many years for some books and for special copies of certain editions. Some of them show a further peculiarity of having vellum and paper combined together, some of the pages being printed on sheets of vellum and some being printed on sheets of paper. A considerable number of these books are printed only on one side of the page. None of the early Mainz books show this peculiarity. Some of these books not only show the curious combination of paper and vellum just noted, but curious combinations of the use of block and type. In some cases the upper part of the page shows a picture printed from a block while the lower part is printed from type.

The blocks thus used are the old familiar blocks of the *Speculum* but with no text carved on the block. Some of the books show the peculiarity of certain pages of text printed from blocks and other pages of text printed from type.

The accompanying illustrations show a reproduction of a page of a *Donatus* printed from blocks, and a reproduction of a *Donatus* printed from type by Coster. They are taken from Holtrop's *Monuments Typographiques des Pays-Bas*. Two pages, not consecutive, of the printed *Donatus*, were found in the binding of a book published in Delft in 1484. The leaves are of vellum, printed on

one side only. The ink is pale and is soluble in water. There is no punctuation and there are no hyphens at the ends of lines where words are divided, showing that the font contained only letters. The lines are fairly regular in length and end with either a complete word or a syllable. The form is well locked up and the presswork is fair. The letters are of slightly varying size and are not in perfect alignment. Apparently each letter was cut independently on the end of the type body and the cutter was not sufficiently skillful to center them perfectly.

Compare this page with the reproductions of the Mazarin, or forty-two line Bible, shown on pages [48](#) and [49](#). We know that the Mazarin Bible was printed not later than 1456. By some it has been attributed to Gutenberg, or at least to his types, but it is now considered the work of Schoeffer. The Mazarin Bible is one of the most perfect and splendid pieces of typography that has ever been produced. Other work attributed to Gutenberg shows a high degree of excellence. It has always been one of the wonders of invention that so difficult and complicated an art as typography should have sprung into being fully perfected, without trace of imperfect experiment. In the rough page of Coster's Donatus we clearly see the imperfect beginning—the missing link.

These peculiarities are exactly what we should expect to find in the missing links between the printing of block books and the printing of books from type. The printer is experimenting. He cuts the lettering off his blocks and combines them with type. He uses type and blocks for the same edition. He experiments with paper. He is very primitive in his methods. A block book could be printed only on one side. He is not yet sure that the type-set book can be printed on both sides. Not improbably he began by using for his type page the same method of printing that he used with his wooden block. It seems pretty clear that in this mass of material, known collectively as the Costeriana, we have the records of the course of experimentation which led from the printing of the image print, with its legend cut on the same block, by placing a sheet of paper or vellum on the inked surface of the block and pressing it down with a frotten, to the production of the book from type-set pages impressed upon both sides of the paper by means of a press.



[illegible]

Coster.



but of good memory, who said that in his boyhood he had heard a certain Cornelis, a book binder, then eighty years old, tell the story of Coster's invention and his struggles to perfect it, including the use of one side of the paper and of several different materials for type. The Burgomaster of Haarlem, Quirinius Talesius, admitted to Junius that in his youth Cornelis had told him the same story, and it is interesting to note in this connection that some of the Costeriana fragments are found in bindings made by this same Cornelis.

One more evidence which, like that of Junius, falls into the third class remains to be cited. In 1499 Koelhoff published the Cologne Chronicle in which he speaks of the invention of printing, using as his authority Ulrich Zell, a printer of the Mainz school, who settled in Cologne. He says that Zell told him that "the art of printing was first found at Mainz, but in the manner as it was then (1499) practiced; the first prefiguration, however, the beginning of that at Mainz, was found in Holland from the Donatuses which had been printed in that country before." Certainly this is not an attribution of the invention of printing either to Mainz or to Gutenberg. It is a distinct confession that it is only the sort of work then being done which was invented at Mainz and that it was suggested by work brought from Holland. It entirely agrees with the Junius account above quoted.

In the Haarlem Town Library there is a pedigree of the Coster family. In its present form it dates from 1559, but the earlier part was evidently copied from an old document. This pedigree says that Lourens Janssoen Coster invented printing in 1446.

While we have not here an exact agreement of dates we have one near enough for all practical purposes. The Costeriana run back for a period which may be conservatively stated at thirty years from 1474, that is to say, to 1444 or thereabouts. Zell says that printed Donatuses came from Holland, but that the art of printing as practiced in 1499 was invented at Mainz, and this invention, as we shall presently show, is fixed as subsequently to 1450. Junius, writing in 1568, says that Coster discovered printing 128 years previously, that is to say, 1440.

If we now turn to the examination of the evidence in support of the claim for Gutenberg, we find that it is lacking in material of the first or even of the second class. It is not absolutely certain that we have any book printed by Gutenberg. If, however, for the sake of the

argument we admit that he printed nearly or quite all of the works that are attributed to him we find that they are all much better in workmanship and appearance than the Haarlem books. None of them are printed on one side of the page only, excepting, of course, small matters which would not cover more than one page, and there are no signs whatever of transition from any previous type of printing to typography. Those who have accepted the theory of Gutenberg's invention have marveled at the perfection of his work, as well they might.

There are only two pieces of evidence of the first class. One is the Helmasperger document, a notary's document concerning the law suit which Fust brought against Gutenberg in 1455. A close examination of this document would appear to show that it tells rather against than in favor of Gutenberg. It appears to show conclusively that Gutenberg had not done any printing before 1450, and had not at that time even made the tools with which to print. In this document Fust speaks of "the work" and "our common work." Gutenberg speaks of "tools" in preparation. Clearly he is borrowing money in order to make tools. He speaks further of "servants' wages, house rent, vellum, paper, ink, etc." and of "the work of the books." The judges speak of "the work to the profit of both of them," "their common use," and the like. There is not a word which speaks distinctly of an invention. It is true that the argument from silence is always dangerous and that those who believe that Gutenberg invented printing could easily read between the lines of this document references to the invention. To one who approaches the subject with an open mind, however, the language is rather that of one who enters into partnership for the carrying on of a business enterprise which is understood by both parties and from which both expect to receive profit rather than that of the man who undertakes to finance an inventor for a share in the invention.

The other piece of evidence of the first class is the letters patent by which Adolph II appointed Gutenberg one of the officers of his court. The document states that the appointment is made for "agreeable and voluntary service rendered to us and our bishopric." It has been argued that as Gutenberg was not a soldier this agreeable and voluntary service must have been the invention of printing. Surely this is a violent assumption. If we believe that Gutenberg invented

printing, we may perhaps see in these words a reference to the invention, although we then marvel why so epoch-making an accomplishment was not specifically mentioned. It is difficult, however, to see why an unconvinced person should be expected to see in such a statement as this any evidence that Gutenberg had invented printing. Certainly there are many other kinds of service which might well have been rendered by one of whom we know so little as we do of Gutenberg.

Zell's testimony, already referred to, is of the second class. Zell's testimony also counts against Gutenberg. He distinctly does not claim that Gutenberg invented any more than the method of printing in use in 1499, admitting that he got his suggestion from the Donatuses brought out of Holland. It has been argued that these Donatuses were block books and that it was from them that Gutenberg got the idea of typography. This argument, however, breaks down at once when we remember that many block books were printed in Germany. There is no earthly reason why the suggestion of typography should have come from a Dutch block book when everybody was familiar with the German ones and had been so familiar for many years.

A careful examination of the documentary evidence which will be found set forth in chronological order in the article on Typography in the eleventh edition of the Encyclopedia Britannica shows several interesting things. While the earlier mentions of printing generally attribute the beginnings of the art to Mainz, few of them speak distinctly of its being invented there. They speak of its being practiced there and being given to Germany and the world from there, claims as we shall presently see quite consistent with the theory of invention elsewhere. Nearly, if not quite, all of the early statements that printing was invented by Gutenberg are traceable either directly to Gutenberg himself, to his family, or to people who would be quoting him or his family. It is not until a comparatively late period that we find any agreement among writers in attributing the invention to Gutenberg.

We are now perhaps in position to form a pretty clear idea of just what happened and to award discriminating credit where it belongs. The present writer believes that it may be considered as settled that Coster invented printing in Haarlem about 1446. Coster did not,

however, found a school of printing. He ceased to print not far from 1481, as about that time we find some of his material used elsewhere. The later years of the century see a few printers in Holland. How far they derived their inspiration from Coster is doubtful. It is certain that Haarlem was not a center from which spread to the rest of Europe and ultimately to the whole world the art preservative of all arts.

The honor of being this center clearly belongs to Mainz. How did the art get there? Probably not through the treachery of a dishonest apprentice. That is one of the legendary features of the Junius story, explained by the fact that in his time everybody knew that the center from which printing spread was Mainz and that the first two printers were John Gutenberg and John Fust. We may at this point accept Zell's account as the true one. Some of Coster's work found its way to Mainz, together, probably, with some general, unscientific statements as to how it was produced. Acting on this hint and with these models before him, Gutenberg reinvented the art, that is, he worked out from the finished product and a general idea of how it was made what was to all intents and purposes an original process superior to the one by which the work in his possession had been produced.

His association with Fust, the business man, and Schoeffer, the craftsman, was the means whereby the invention became profitable to the world, though not to Gutenberg. There is no reason to suppose that Fust was an unprincipled schemer who stole Gutenberg's invention and profited by it. He was a business man who made a contract with another man for the carrying on of a certain manufacturing process, setting his capital against the other man's labor for an equal share in the profit. There was not only no profit, but the working partner did not live up to his side of the contract. Fust sued, obtained a judgment, and under this judgment took over a great part at least of the equipment which his money had paid for. While the criminal procedure of this age was of a very harsh and primitive sort the judgments of the German courts in civil cases appear generally to have been fairly just. When we consider Gutenberg's record of financial slipperiness there seems no reason to doubt that it was just in this case. On obtaining the business Fust associated with himself the young journeyman, Peter Schoeffer, who

had learned the business in the Gutenberg and Fust establishment and had married Fust's daughter. He was an excellent workman and his skill, backed by Fust's capital, set the new invention on a practical basis and insured its future.

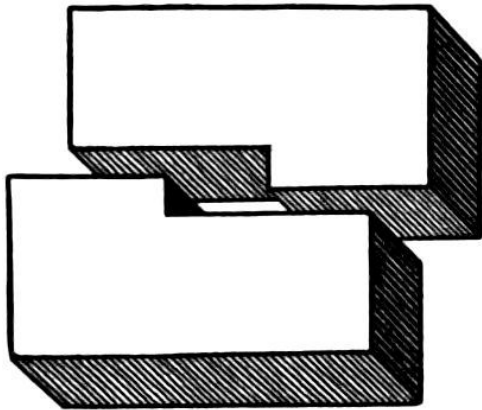
In deciding against the claims of Gutenberg to the invention we by no means deprive him of all share in the glory. The reinvention with improvements was nearly if not quite as creditable a task as the invention, especially when we remember how simple a step the actual inventor took in going from his block book to his type-set book. The invention of Coster was sterile. The reinvention of Gutenberg was fruitful. It was Mainz and not Haarlem which actually gave printing to the world.

In view of all this the early testimonies are not so conflicting as they seem. We have seen that the testimonies of Junius and of Zell supplement each other. We can see that the early authorities were right in their claim that printing was given to Germany and the world by Mainz, and at the same time that the claim is not, as has been hastily supposed, a claim that it was invented there. We can see that the reinvention of printing might well seem so important to Gutenberg himself and to his family that they should claim that he invented it. The statement in the letters patent may well refer to the service which Gutenberg rendered to the court and bishopric of Adolph II by the introduction of typography because he unquestionably did thus render them great service, and we are no longer surprised at the omission of a distinct statement that Gutenberg was rewarded for inventing typography. In a word, the Gutenberg monuments need not come down, but the inscriptions on them should be changed.

## CHAPTER V

### MATERIALS AND METHODS OF THE FIRST PRINTERS

Our knowledge of Coster is much less complete than our knowledge of Gutenberg. Much, however, that could be said of one would undoubtedly be true of the other. It is reported that Coster began with wooden type. This would naturally be the first step forward from the block book, which was invariably printed from wood. Finding that wooden type was unsatisfactory in the press, he experimented with lead and with tin, we are told. Obviously he would not get satisfactory results with either of these metals unalloyed. The use of unsatisfactory material probably accounts for the number of fonts of type which he employed in his comparatively small output.



Showing Principle of a  
Type Mold

Gutenberg and his associates invented a more satisfactory type metal and an improved method for the making of type. The first types appear to have been carved individually by hand. This was a great task, but not as great as might appear. The early printers printed their books page by page. When one page was printed in sufficient numbers for the edition the type was distributed and another page set up, and so on. In this way a comparatively small amount of type would suffice for the equipment of a

small shop. It was not long, however, before the superiority of casting was perceived.



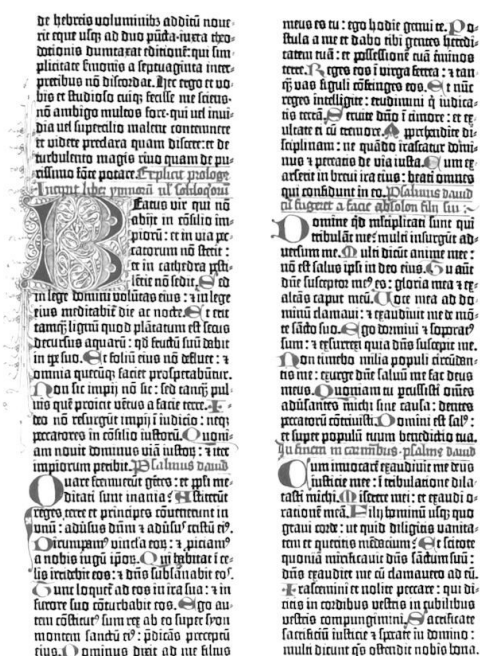
The first mold was probably two notched blocks of brass or copper, like those shown in the accompanying illustration, a method being provided of accurately positioning the matrix under the opening in the mold and also of holding the two blocks firmly together. From the illustration it will be noted that when the blocks are forced together a square opening remains. Still keeping the blocks together, but sliding down the one at the right, one dimension of the opening does not change, but the other can be varied. This mold has been improved in detail, but not greatly altered in principle down to this day. A fairly satisfactory form of matrix very similar to the one in use today was soon devised. This was made by cutting the letter in relief on the end of a soft steel or iron punch which was then hardened and driven into a block of soft brass or copper, which became the matrix.

**D**omine qđ multiplicati  
tribulāt me: multi in  
uersum me. Multi dicūt an  
nō est salus īpli in deo eius.  
Dñe susceptor me⁹ es: gloriā  
altā caput meū. Voce in  
mīnū clamaui: ⁊ exaudiuit  
te sāto suo. Ergo dormiui ⁊  
lumi: ⁊ exurrexi quia dñs su

Type of the Mazarin Bible (exact  
size)

The type, as has been said, was cut to resemble the handwriting of the scribes in the locality where the book was printed. This would be the obvious method because it must be remembered that the rapid reproduction of manuscripts was the sole end which the first printers had in view. They did not think of developing a conventional book type different from handwriting or script. They simply imitated the script which was current, and consequently most legible, in their neighborhood. The school boys of that day did not have to learn two alphabets, one the script letter and the other the printed letter, as we do today. The device of spacing was immediately adopted. The letters

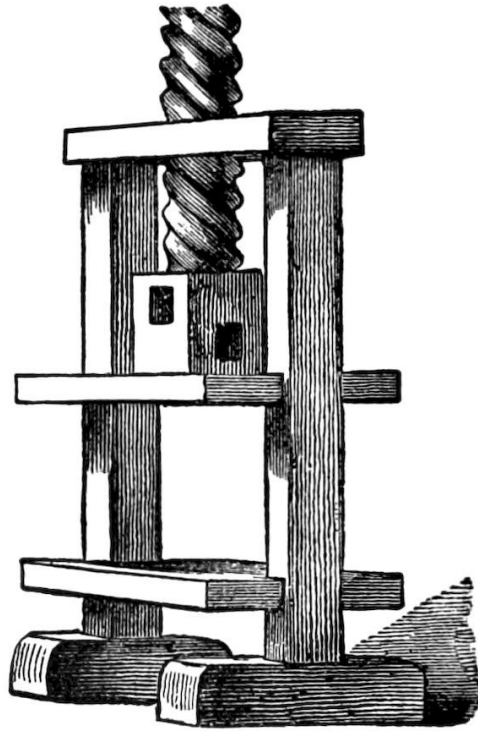
were cast, however, upon bodies with wide shoulders at top and bottom and used without leads.



Page from the Mazarin Bible  
(reduced)

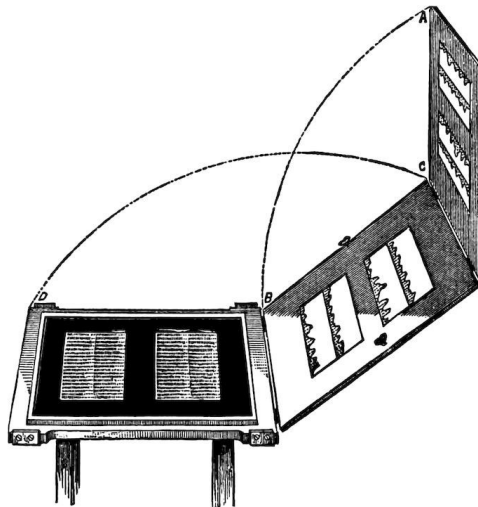
The types of the period were both handsome and legible. Perhaps they may not be easy for us to read, but that is because we are not familiar with the forms of the letters used and especially with the contractions and abbreviations which were common. The beauty of some of these early types will be seen from the little specimen of the type of the Mazarin Bible which is herewith reproduced in full size.

With the example of the illuminators before them the early printers paid much attention to the ornamenting of their pages. They introduced some ornaments of their own and they occasionally left space for the hand illuminator to use in supplementing their work. A full page of the Mazarin Bible greatly reduced is shown herewith. By comparing that with the specimen of full size type and imagining the whole page thrown up to natural size one can see what a really beautiful book this famous Bible was.



An Early Printing Press

The press in use was of the most simple form imaginable, as shown by the accompanying illustration. It was an adaptation of a familiar mechanical device, with no originality about it. It was made of wood and was operated by a screw turning through a nut, the moving of the screw bringing the platen and bed into contact. The form was released by the reverse movement of the screw. After a while the sliding bed and frisket shown in the accompanying illustration were introduced and there the mechanism stopped for a long time.



Bed of Hand Press Showing Tympan  
and Frisket

The first twenty-five years or so of printing have been described as a period of stagnation. They have also been described as the period of the workman. Apparently the vast possibilities of the new art were slow in obtaining recognition. The earliest printers were only mechanics. They had not yet got the vision of combining scholarship with their art and so unlocking the treasures of the world to mankind generally, still less that of adding to the sum total of human knowledge. They had found out an art by which manuscripts could be rapidly produced and money made by their sale, and that was all.

They contented themselves with a slavish imitation of manuscripts, with apparently no thought of their being anything more than manuscript imitators. This condition of things, however, could not last long. It was inevitable that the scholars of the world should become interested in this new process and should begin to see its advantages. After twenty or twenty-five years of printing this took place. The period of sluggish and practically dormant infancy passed and the development of the art began, as we shall see in the next volume of this series, No. 51, *A Short History of Printing, Part I*.

## **SUPPLEMENTARY READING**

THE STORY OF BOOKS. By Gertrude Burford Rawlings. McClure, Phillips & Co., New York.

THE INVENTION OF PRINTING. By Theodore L. De Vinne. Oswald Publishing Co., New York.

HAARLEM, NOT MAINZ. By J. H. Hesels.

EARLY PRINTED BOOKS. By E. Gordon Duff.

BOOKS AND THEIR MAKERS IN THE MIDDLE AGES. Vol. I. by George Haven Putnam. G. P. Putnam's Sons, New York.

ENCYCLOPEDIA BRITANNICA. Eleventh Edition. Article on Typography.

Pupils who have access to large libraries should consult J.W. Holtrop's *Monuments Typographiques des Pays-Bas* and Samuel Sotheby's *Principia*, both of which contain many excellent reproductions of very early printing. Sotheby's book is commonly referred to as above, but is published under several different names in editions which vary but little. Perhaps the best is entitled *Typography of the Fifteenth Century*.

## **SUGGESTIONS TO STUDENTS AND INSTRUCTORS**

The following questions, based on the contents of this volume, are intended to serve (1) as a guide to the study of the text, (2) as an aid to the student in putting the information contained into definite statements without actually memorizing the text, (3) as a means of securing from the student a reproduction of the information in his own words.

A careful following of the questions by the reader will insure full acquaintance with every part of the text, avoiding the accidental omission of what might be of value. These primers are so condensed that nothing should be omitted.

In teaching from these books it is very important that these questions and such others as may occur to the teacher should be made the basis of frequent written work, and of final examinations.

The importance of written work cannot be overstated. It not only assures knowledge of material but the power to express that knowledge correctly and in good form.

If this written work can be submitted to the teacher in printed form it will be doubly useful.

## QUESTIONS

1. What interesting fact is noted about most great inventions and what is the reason for it?
2. Give some well known instances.
3. How does this condition apply to the invention of printing?
4. Why may we question De Vinne's decision?
5. Why was the discovery of typography inevitable about 1450?
6. What was the condition of England and France at this time?
7. What was the condition of Italy?
8. What was the condition of Germany, Spain, and Portugal?
9. What was the condition of the church?
10. What important movement was made possible by these political conditions?
11. Name some important events in the movement.
12. What had all this to do with book-making?
13. What were the shortcomings of manuscript books?
14. What materials were already invented and ready for the printer?
15. Tell what you can about each.
16. What is typography?
17. What were the earliest predecessors of typography?
18. Tell of some later methods of making impressions.
19. What early attempts at printing were made by the Chinese and their neighbors?
20. Did these attempts develop into typography, and why?

21. What devices took the place of books among the poor before the invention of printing?
22. What were image prints, and how made?
23. What were the two lines of development from the image prints?
24. How did these developments suggest typography?
25. How were early playing cards made, and what was their relation to block printing?
26. Name some of the places where and persons by whom typography is said to have been invented.
27. Tell the story of Waldfoghel, and what we conclude about it.
28. Tell the Coster legend.
29. What do we know about Gutenberg before 1450?
30. What was his contract of that year with Fust?
31. How did it work out?
32. What do we know of Gutenberg after 1455?
33. Give the main points of the Gutenberg legend.
34. What are the clear facts about early Mainz printing?
35. What are the three classes of historical evidence?
36. What can you say, with this distinction in mind, about the evidence concerning the invention of typography?
37. What evidence of the first class is there coming from Haarlem?
38. Why do we claim that this evidence comes from Haarlem?
39. Why did the printer use so many fonts of type for so few books?
40. What internal evidence is there for the date of these books?
41. What are the peculiarities of these books?
42. What do these peculiarities show?



43. What piece of evidence of the second class have we which bears on these books?
44. What pieces of evidence of the third class have we which bear on these books?
45. What does all this evidence seem to show as to who invented typography, where, and when?
46. What do the printed pieces attributed to Gutenberg show?
47. What does the Helmasperger document show?
48. What does the patent of Adolph II show?
49. What does Zell's statement show?
50. What can you say of the early statements that Gutenberg invented typography?
51. Compare the results of the work of Coster and of Gutenberg.
52. How did the Haarlem invention get to Mainz?
53. What did Gutenberg really do?
54. What was the outcome of his work?
55. How does this theory explain the doubtful or conflicting evidence?
56. What can you say about Coster's type?
57. How were the first types made?
58. What two important inventions in type-making do we owe to Gutenberg and his associates?
59. What can you tell about the first type faces?
60. Why are the early books so beautiful?
61. Describe Gutenberg's press and the first improvements upon it.
62. What has the first period of about twenty-five years of typography been called, and why?

## TYPOGRAPHIC TECHNICAL SERIES FOR APPRENTICES

The following list of publications, comprising the TYPOGRAPHIC TECHNICAL SERIES FOR APPRENTICES, has been prepared under the supervision of the Committee on Education of the United Typothetae of America for use in trade classes, in course of printing instruction, and by individuals.

Each publication has been compiled by a competent author or group of authors, and carefully edited, the purpose being to provide the printers of the United States—employers, journeymen, and apprentices—with a comprehensive series of handy and inexpensive compendiums of reliable, up-to-date information upon the various branches and specialties of the printing craft, all arranged in orderly fashion for progressive study.

The publications of the series are of uniform size, 5×8 inches. Their general make-up, in typography, illustrations, etc., has been, as far as practicable, kept in harmony throughout. A brief synopsis of the particular contents and other chief features of each volume will be found under each title in the following list.

Each topic is treated in a concise manner, the aim being to embody in each publication as completely as possible all the rudimentary information and essential facts necessary to an understanding of the subject. Care has been taken to make all statements accurate and clear, with the purpose of bringing essential information within the understanding of beginners in the different fields of study. Wherever practicable, simple and well-defined drawings and illustrations have been used to assist in giving additional clearness to the text.

In order that the pamphlets may be of the greatest possible help for use in trade-school classes and for self-instruction, each title is accompanied by a list of Review Questions covering essential items of the subject matter. A short Glossary of technical terms belonging to the subject or department treated is also added to many of the books.

These are the Official Text-books of the United Typothetae of America.

Address all orders and inquiries to COMMITTEE ON EDUCATION,  
UNITED TYPOTHETAE OF AMERICA, CHICAGO, ILLINOIS, U. S. A.

*PART I—Types, Tools, Machines, and Materials*

**1. Type: a Primer of Information** By A. A. Stewart

Relating to the mechanical features of printing types; their sizes, font schemes, etc., with a brief description of their manufacture. 44 pp.; illustrated; 74 review questions; glossary.

**2. Compositors' Tools and Materials** By A. A. Stewart

A primer of information about composing sticks, galleys, leads, brass rules, cutting and mitring machines, etc. 47 pp.; illustrated; 50 review questions; glossary.

**3. Type Cases, Composing Room Furniture** By A. A. Stewart

A primer of information about type cases, work stands, cabinets, case racks, galley racks, standing galleys, etc. 43 pp.; illustrated; 33 review questions; glossary.

**4. Imposing Tables and Lock-up Appliances** By A. A. Stewart

Describing the tools and materials used in locking up forms for the press, including some modern utilities for special purposes. 59 pp.; illustrated; 70 review questions; glossary.

**5. Proof Presses** By A. A. Stewart

A primer of information about the customary methods and machines for taking printers' proofs. 40pp.; illustrated; 41 review questions; glossary.

**6. Platen Printing Presses** By Daniel Baker

A primer of information regarding the history and mechanical construction of platen printing presses, from the original hand press to the modern job press, to which is added a chapter on automatic presses of small size. 51 pp.; illustrated; 49 review questions; glossary.

**7. Cylinder Printing Presses** By Herbert L. Baker

Being a study of the mechanism and operation of the principal types of cylinder printing machines. 64 pp.; illustrated; 47 review questions; glossary.

**8. Mechanical Feeders and Folders** By William E. Spurrier

The history and operation of modern feeding and folding machines; with hints on their care and adjustments. Illustrated; review questions; glossary.

**9. Power for Machinery in Printing Houses** By Carl F. Scott

A treatise on the methods of applying power to printing presses and allied machinery with particular reference to electric drive. 53 pp.; illustrated; 69 review questions; glossary.

**10. Paper Cutting Machines** By Niel Gray, Jr.

A primer of information about paper and card trimmers, hand-lever cutters, power cutters, and other automatic machines for cutting paper, 70 pp.; illustrated; 115 review questions; glossary.

**11. Printers' Rollers** By A. A. Stewart

A primer of information about the composition, manufacture, and care of inking rollers. 46 pp.; illustrated; 61 review questions; glossary.

**12. Printing Inks** By Philip Ruxton

Their composition, properties and manufacture (reprinted by permission from Circular No. 53, United States Bureau of Standards); together with some helpful suggestions about the everyday use of printing inks by Philip Ruxton. 80 pp.; 100 review questions; glossary.

**13. How Paper is Made** By William Bond Wheelwright

A primer of information about the materials and processes of manufacturing paper for printing and writing. 68 pp.; illustrated; 62 review questions; glossary.

**14. Relief Engravings** By Joseph P. Donovan

Brief history and non-technical description of modern methods of engraving; woodcut, zinc plate, halftone; kind of copy for

reproduction; things to remember when ordering engravings. Illustrated; review questions; glossary.

**15. Electrotyping and Stereotyping** By Harris B. Hatch and A. A. Stewart

A primer of information about the processes of electrotyping and stereotyping. 94 pp.; illustrated; 129 review questions; glossaries.

PART II—*Hand and Machine Composition*

**16. Typesetting** By A. A. Stewart

A handbook for beginners, giving information about justifying, spacing, correcting, and other matters relating to typesetting. Illustrated; review questions; glossary.

**17. Printers' Proofs** By A. A. Stewart

The methods by which they are made, marked, and corrected, with observations on proofreading. Illustrated; review questions; glossary.

**18. First Steps in Job Composition** By Camille De Véze

Suggestions for the apprentice compositor in setting his first jobs, especially about the important little things which go to make good display in typography. 63 pp.; examples; 55 review questions; glossary.

**19. General Job Composition**

How the job compositor handles business stationery, programs and miscellaneous work. Illustrated; review questions; glossary.

**20. Book Composition** By J. W. Bothwell

Chapters from DeVinne's "Modern Methods of Book Composition," revised and arranged for this series of text-books by J. W. Bothwell of The DeVinne Press, New York. Part I: Composition of pages. Part II: Imposition of pages. 229 pp.; illustrated; 525 review questions; glossary.

**21. Tabular Composition** By Robert Seaver

A study of the elementary forms of table composition, with examples of more difficult composition. 36 pp.; examples; 45 review questions.

**22. Applied Arithmetic** By E. E. Sheldon

Elementary arithmetic applied to problems of the printing trade, calculation of materials, paper weights and sizes, with standard tables and rules for computation, each subject amplified with examples and exercises. 159 pp.

**23. Typesetting and Composing Machines** A. W. Finlay, Editor

Section I—The Linotype By L. A. Hornstein Section II—The Monotype By Joseph Hays Section III—The Intertype By Henry W. Cozzens Section IV—Other Typesetting and Typesetting Machines By Frank H. Smith

A brief history of typesetting machines, with descriptions of their mechanical principles and operations. Illustrated; review questions; glossary.

*PART III—Imposition and Stonework*

**24. Locking Forms for the Job Press** By Frank S. Henry

Things the apprentice should know about locking up small forms, and about general work on the stone. Illustrated; review questions; glossary.

**25. Preparing Forms for the Cylinder Press** By Frank S. Henry

Pamphlet and catalog imposition; margins; fold marks, etc. Methods of handling type forms and electrotype forms. Illustrated; review questions; glossary.

*PART IV—Presswork*

**26. Making Ready on Platen Presses** By T. G. McGrew

The essential parts of a press and their functions; distinctive features of commonly used machines. Preparing the tympan, regulating the impression, underlaying and overlaying, setting

gauges, and other details explained. Illustrated; review questions; glossary.

**27. Cylinder Presswork** By T. G. McGrew

Preparing the press; adjustment of bed and cylinder, form rollers, ink fountain, grippers and delivery systems. Underlaying and overlaying; modern overlay methods. Illustrated; review questions; glossary.

**28. Pressroom Hints and Helps** By Charles L. Dunton

Describing some practical methods of pressroom work, with directions and useful information relating to a variety of printing-press problems. 87 pp.; 176 review questions.

**29. Reproductive Processes of the Graphic Arts** By A. W. Elson

A primer of information about the distinctive features of the relief, the intaglio, and the planographic processes of printing. 84 pp.; illustrated; 100 review questions; glossary.

*PART V—Pamphlet and Book Binding*

**30. Pamphlet Binding** By Bancroft L. Goodwin

A primer of information about the various operations employed in binding pamphlets and other work in the bindery. Illustrated; review questions; glossary.

**31. Book Binding** By John J. Pleger

Practical information about the usual operations in binding books; folding; gathering, collating, sewing, forwarding, finishing. Case making and cased-in books. Hand work and machine work. Job and blank-book binding. Illustrated; review questions; glossary.

*PART VI—Correct Literary Composition*

**32. Word Study and English Grammar** By F. W. Hamilton

A primer of information about words, their relations, and their uses. 68 pp.; 84 review questions; glossary.

**33. Punctuation** By F. W. Hamilton

A primer of information about the marks of punctuation and their use, both grammatically and typographically. 56 pp.; 59 review questions; glossary.

**34. Capitals** By F. W. Hamilton

A primer of information about capitalization, with some practical typographic hints as to the use of capitals. 48 pp.; 92 review questions; glossary.

**35. Division of Words** By F. W. Hamilton

Rules for the division of words at the ends of lines, with remarks on spelling, syllabication and pronunciation. 42 pp.; 70 review questions.

**36. Compound Words** By F. W. Hamilton

A study of the principles of compounding, the components of compounds, and the use of the hyphen. 34 pp.; 62 review questions.

**37. Abbreviations and Signs** By F. W. Hamilton

A primer of information about abbreviations and signs, with classified lists of those in most common use. 58 pp.; 32 review questions.

**38. The Uses of Italic** By F. W. Hamilton

A primer of information about the history and uses of italic letters. 31 pp.; 37 review questions.

**39. Proofreading** By Arnold Levitas

The technical phases of the proofreader's work; reading, marking, revising, etc.; methods of handling proofs and copy. Illustrated by examples. 59 pp.; 69 review questions; glossary.

**40. Preparation of Printers' Copy** By F. W. Hamilton

Suggestions for authors, editors, and all who are engaged in preparing copy for the composing room. 36 pp.; 67 review questions.

**41. Printers' Manual of Style**



A reference compilation of approved rules, usages, and suggestions relating to uniformity in punctuation, capitalization, abbreviations, numerals, and kindred features of composition.

**42. The Printer's Dictionary** By A. A. Stewart

A handbook of definitions and miscellaneous information about various processes of printing, alphabetically arranged. Technical terms explained. Illustrated.

PART VII—*Design, Color, and Lettering*

**43. Applied Design for Printers** By Harry L. Gage

A handbook of the principles of arrangement, with brief comment on the periods of design which have most influenced printing. Treats of harmony, balance, proportion, and rhythm; motion; symmetry and variety; ornament, esthetic and symbolic. 37 illustrations; 46 review questions; glossary; bibliography.

**44. Elements of Typographic Design** By Harry L. Gage

Applications of the principles of decorative design. Building material of typography: paper, types, ink, decorations and illustrations. Handling of shapes. Design of complete book, treating each part. Design of commercial forms and single units. Illustrations; review questions, glossary; bibliography.

**45. Rudiments of Color in Printing** By Harry L. Gage

Use of color: for decoration of black and white, for broad poster effect, in combinations of two, three, or more printings with process engravings. Scientific nature of color, physical and chemical. Terms in which color may be discussed: hue, value, intensity. Diagrams in color, scales and combinations. Color theory of process engraving. Experiments with color. Illustrations in full color, and on various papers. Review questions; glossary; bibliography.

**46. Lettering in Typography** By Harry L. Gage

Printer's use of lettering: adaptability and decorative effect. Development of historic writing and lettering and its influence on type design. Classification of general forms in lettering.

Application of design to lettering. Drawing for reproduction. Fully illustrated; review questions; glossary; bibliography.

**47. Typographic Design in Advertising** By Harry L. Gage

The printer's function in advertising. Precepts upon which advertising is based. Printer's analysis of his copy. Emphasis, legibility, attention, color. Method of studying advertising typography. Illustrations; review questions; glossary; bibliography.

**48. Making Dummies and Layouts** By Harry L. Gage

A layout: the architectural plan. A dummy: the imitation of a proposed final effect. Use of dummy in sales work. Use of layout. Function of layout man. Binding schemes for dummies. Dummy envelopes. Illustrations; review questions; glossary; bibliography.

PART VIII—*History of Printing*

**49. Books Before Typography** By F. W. Hamilton

A primer of information about the invention of the alphabet and the history of book-making up to the invention of movable types. 62 pp.; illustrated; 64 review questions.

**50. The Invention of Typography** By F. W. Hamilton

A brief sketch of the invention of printing and how it came about. 64 pp.; 62 review questions.

**51. History of Printing Part I** By F. W. Hamilton

A primer of information about the beginnings of printing, the development of the book, the development of printers' materials, and the work of the great pioneers. 63 pp.; 55 review questions.

**52. History of Printing Part II** By F. W. Hamilton

A brief sketch of the economic conditions of the printing industry from 1450 to 1789, including government regulations, censorship, internal conditions and industrial relations. 94 pp.; 128 review questions.

**53. Printing in England** By F. W. Hamilton

A short history of printing in England from Caxton to the present time. 89 pp.; 65 review questions.

**54. Printing in America** By F. W. Hamilton

A brief sketch of the development of the newspaper, and some notes on publishers who have especially contributed to printing. 98 pp.; 84 review questions.

**55. Type and Presses in America** By F. W. Hamilton

A brief historical sketch of the development of type casting and press building in the United States. 52 pp.; 61 review questions.

*PART IX—Cost Finding and Accounting*

**56. Elements of Cost in Printing** By Henry P. Porter

The Standard Cost-Finding Forms and their uses. What they should show. How to utilize the information they give. Review questions. Glossary.

**57. Use of a Cost System** By Henry P. Porter

The Standard Cost-Finding Forms and their uses. What they should show. How to utilize the information they give. Review questions. Glossary.

**58. The Printer as a Merchant** By Henry P. Porter

The selection and purchase of materials and supplies for printing. The relation of the cost of raw material and the selling price of the finished product. Review questions. Glossary.

**59. Fundamental Principles of Estimating** By Henry P. Porter

The estimator and his work; forms to use; general rules for estimating. Review questions. Glossary.

**60. Estimating and Selling** By Henry P. Porter

An insight into the methods used in making estimates, and their relation to selling. Review questions. Glossary.

**61. Accounting for Printers** By Henry P. Porter

A brief outline of an accounting system for printers; necessary books and accessory records. Review questions. Glossary.

PART X—*Miscellaneous*

**62. Health, Sanitation, and Safety** By Henry P. Porter

Hygiene in the printing trade; a study of conditions old and new; practical suggestions for improvement; protective appliances and rules for safety.

**63. Topical Index** By F. W. Hamilton

A book of reference covering the topics treated in the Typographic Technical Series, alphabetically arranged.

**64. Courses of Study** By F. W. Hamilton

A guidebook for teachers, with outlines and suggestions for classroom and shop work.

## ACKNOWLEDGMENT

This series of Typographic Text-books is the result of the splendid co-operation of a large number of firms and individuals engaged in the printing business and its allied industries in the United States of America.

The Committee on Education of the United Typothetae of America, under whose auspices the books have been prepared and published, acknowledges its indebtedness for the generous assistance rendered by the many authors, printers, and others identified with this work.

While due acknowledgment is made on the title and copyright pages of those contributing to each book, the Committee nevertheless felt that a group list of co-operating firms would be of interest.

The following list is not complete, as it includes only those who have co-operated in the production of a portion of the volumes, constituting the first printing. As soon as the entire list of books comprising the Typographic Technical Series has been completed (which the Committee hopes will be at an early date), the full list will be printed in each volume.

The Committee also desires to acknowledge its indebtedness to the many subscribers to this Series who have patiently awaited its publication.

COMMITTEE ON EDUCATION,  
UNITED TYPOTHETAE OF AMERICA.

HENRY P. PORTER, *Chairman*,  
E. LAWRENCE FELL,  
A. M. GLOSSBRENNER,  
J. CLYDE OSWALD,

TOBY RUBOVITS.

FREDERICK W. HAMILTON, *Education*  
*Director.*

# CONTRIBUTORS

## **For Composition and Electrotypes**

ISAAC H. BLANCHARD COMPANY, New York, N. Y.  
S. H. BURBANK & Co., Philadelphia, Pa.  
J. S. CUSHING & Co., Norwood, Mass.  
THE DEVINNE PRESS, New York, N. Y.  
R. R. DONNELLEY & SONS Co., Chicago, Ill.  
GEO. H. ELLIS Co., Boston, Mass.  
EVANS-WINTER-HEBB, Detroit, Mich.  
FRANKLIN PRINTING COMPANY, Philadelphia, Pa.  
F. H. GILSON COMPANY, Boston, Mass.  
STEPHEN GREENE & Co., Philadelphia, Pa.  
W. F. HALL PRINTING Co., Chicago, Ill.  
J. B. LIPPINCOTT Co., Philadelphia, Pa.  
McCALLA & Co. INC., Philadelphia, Pa.  
THE PATTESON PRESS, NEW YORK, New York  
THE PLIMPTON PRESS, Norwood, Mass.  
POOLE BROS., Chicago, Ill.  
EDWARD STERN & Co., Philadelphia, Pa.  
THE STONE PRINTING & MFG. Co., Roanoke, Va.  
C. D. TRAPHAGEN, Lincoln, Neb.  
THE UNIVERSITY PRESS, Cambridge, Mass.

## **For Composition**

BOSTON TYPOTHETAE SCHOOL OF PRINTING, Boston, Mass,  
WILLIAM F. FELL Co., Philadelphia, Pa.  
THE KALKHOFF COMPANY, New York, N. Y.  
OXFORD-PRINT, Boston, Mass.  
TOBY RUBOVITS, Chicago, Ill.

## **For Electrotypes**

BLOMGREN BROTHERS Co., Chicago, Ill.  
FLOWER. STEEL ELECTROTYPING Co., New York, N. Y.  
C. J. PETERS & SON Co., Boston, Mass.  
ROYAL ELECTROTYPE Co., Philadelphia, Pa.  
H. C. WHITCOMB & Co., Boston, Mass.

### **For Engravings**

AMERICAN TYPE FOUNDERS Co., Boston, Mass.  
C. B. COTTRELL & SONS Co., Westerly, R. I.  
GOLDING MANUFACTURING Co., Franklin, Mass.  
HARVARD UNIVERSITY, Cambridge, Mass.  
INLAND PRINTER Co., Chicago, Ill.  
LANSTON MONOTYPE MACHINE COMPANY, Philadelphia,  
Pa.  
MERGENTHALER LINOTYPE COMPANY, New York, N. Y.  
GEO. H. MORRILL Co., Norwood, Mass.  
OSWALD PUBLISHING Co., New York, N. Y.  
THE PRINTING ART, Cambridge, Mass.  
B. D. RISING PAPER COMPANY, Housatonic, Mass.  
THE VANDERCOOK PRESS, Chicago, Ill.

### **For Book Paper**

AMERICAN WHITING PAPER Co., Holyoke, Mass.  
WEST VIRGINIA PULP & PAPER Co., Mechanicville, N. Y.



## TRANSCRIBER'S NOTES

1. Silently corrected obvious typographical errors and variations in spelling.
2. Retained archaic, non-standard, and uncertain spellings as printed.

\*\*\* END OF THE PROJECT GUTENBERG EBOOK THE INVENTION OF TYPOGRAPHY \*\*\*

Updated editions will replace the previous one—the old editions will be renamed.

Creating the works from print editions not protected by U.S. copyright law means that no one owns a United States copyright in these works, so the Foundation (and you!) can copy and distribute it in the United States without permission and without paying copyright royalties. Special rules, set forth in the General Terms of Use part of this license, apply to copying and distributing Project Gutenberg™ electronic works to protect the PROJECT GUTENBERG™ concept and trademark. Project Gutenberg is a registered trademark, and may not be used if you charge for an eBook, except by following the terms of the trademark license, including paying royalties for use of the Project Gutenberg trademark. If you do not charge anything for copies of this eBook, complying with the trademark license is very easy. You may use this eBook for nearly any purpose such as creation of derivative works, reports, performances and research. Project Gutenberg eBooks may be modified and printed and given away—you may do practically

ANYTHING in the United States with eBooks not protected by U.S. copyright law. Redistribution is subject to the trademark license, especially commercial redistribution.

**START: FULL LICENSE**  
**THE FULL PROJECT GUTENBERG LICENSE**  
**PLEASE READ THIS BEFORE YOU DISTRIBUTE OR USE THIS**  
**WORK**

To protect the Project Gutenberg™ mission of promoting the free distribution of electronic works, by using or distributing this work (or any other work associated in any way with the phrase “Project Gutenberg”), you agree to comply with all the terms of the Full Project Gutenberg™ License available with this file or online at [www.gutenberg.org/license](http://www.gutenberg.org/license).

**Section 1. General Terms of Use and Redistributing Project Gutenberg™ electronic works**

1.A. By reading or using any part of this Project Gutenberg™ electronic work, you indicate that you have read, understand, agree to and accept all the terms of this license and intellectual property (trademark/copyright) agreement. If you do not agree to abide by all the terms of this agreement, you must cease using and return or destroy all copies of Project Gutenberg™ electronic works in your possession. If you paid a fee for obtaining a copy of or access to a Project Gutenberg™ electronic work and you do not agree to be bound by the terms of this agreement, you may obtain a refund from the person or entity to whom you paid the fee as set forth in paragraph 1.E.8.

1.B. “Project Gutenberg” is a registered trademark. It may only be used on or associated in any way with an electronic work by people who agree to be bound by the terms of this agreement. There are a few things that you can do with most Project Gutenberg™ electronic works even without complying with the full terms of this agreement. See paragraph 1.C below. There are a lot of things you can do with Project Gutenberg™ electronic works if you follow the terms of this

agreement and help preserve free future access to Project Gutenberg™ electronic works. See paragraph 1.E below.

1.C. The Project Gutenberg Literary Archive Foundation (“the Foundation” or PGLAF), owns a compilation copyright in the collection of Project Gutenberg™ electronic works. Nearly all the individual works in the collection are in the public domain in the United States. If an individual work is unprotected by copyright law in the United States and you are located in the United States, we do not claim a right to prevent you from copying, distributing, performing, displaying or creating derivative works based on the work as long as all references to Project Gutenberg are removed. Of course, we hope that you will support the Project Gutenberg™ mission of promoting free access to electronic works by freely sharing Project Gutenberg™ works in compliance with the terms of this agreement for keeping the Project Gutenberg™ name associated with the work. You can easily comply with the terms of this agreement by keeping this work in the same format with its attached full Project Gutenberg™ License when you share it without charge with others.

1.D. The copyright laws of the place where you are located also govern what you can do with this work. Copyright laws in most countries are in a constant state of change. If you are outside the United States, check the laws of your country in addition to the terms of this agreement before downloading, copying, displaying, performing, distributing or creating derivative works based on this work or any other Project Gutenberg™ work. The Foundation makes no representations concerning the copyright status of any work in any country other than the United States.

1.E. Unless you have removed all references to Project Gutenberg:

1.E.1. The following sentence, with active links to, or other immediate access to, the full Project Gutenberg™ License must appear prominently whenever any copy of a Project Gutenberg™ work (any work on which the phrase “Project Gutenberg” appears, or with which the phrase “Project Gutenberg” is associated) is accessed, displayed, performed, viewed, copied or distributed:

This eBook is for the use of anyone anywhere in the United States and most other parts of the world at no cost and with almost no restrictions whatsoever. You may copy it, give it away or re-use it under the terms of the Project Gutenberg License included with this eBook or online at [www.gutenberg.org](http://www.gutenberg.org). If you are not located in the United States, you will have to check the laws of the country where you are located before using this eBook.

1.E.2. If an individual Project Gutenberg™ electronic work is derived from texts not protected by U.S. copyright law (does not contain a notice indicating that it is posted with permission of the copyright holder), the work can be copied and distributed to anyone in the United States without paying any fees or charges. If you are redistributing or providing access to a work with the phrase “Project Gutenberg” associated with or appearing on the work, you must comply either with the requirements of paragraphs 1.E.1 through 1.E.7 or obtain permission for the use of the work and the Project Gutenberg™ trademark as set forth in paragraphs 1.E.8 or 1.E.9.

1.E.3. If an individual Project Gutenberg™ electronic work is posted with the permission of the copyright holder, your use and distribution must comply with both paragraphs 1.E.1 through 1.E.7 and any additional terms imposed by the copyright holder. Additional terms will be linked to the Project Gutenberg™ License for all works posted with the permission of the copyright holder found at the beginning of this work.

1.E.4. Do not unlink or detach or remove the full Project Gutenberg™ License terms from this work, or any files containing a part of this work or any other work associated with Project Gutenberg™.

1.E.5. Do not copy, display, perform, distribute or redistribute this electronic work, or any part of this electronic work, without prominently displaying the sentence set forth in paragraph 1.E.1 with active links or immediate access to the full terms of the Project Gutenberg™ License.

1.E.6. You may convert to and distribute this work in any binary, compressed, marked up, nonproprietary or proprietary form, including any word processing or hypertext form. However, if you provide access to or distribute copies of a Project Gutenberg™ work in a format other than “Plain Vanilla ASCII” or other format used in the official version posted on the official Project Gutenberg™ website ([www.gutenberg.org](http://www.gutenberg.org)), you must, at no additional cost, fee or expense to the user, provide a copy, a means of exporting a copy, or a means of obtaining a copy upon request, of the work in its original “Plain Vanilla ASCII” or other form. Any alternate format must include the full Project Gutenberg™ License as specified in paragraph 1.E.1.

1.E.7. Do not charge a fee for access to, viewing, displaying, performing, copying or distributing any Project Gutenberg™ works unless you comply with paragraph 1.E.8 or 1.E.9.

1.E.8. You may charge a reasonable fee for copies of or providing access to or distributing Project Gutenberg™ electronic works provided that:

- You pay a royalty fee of 20% of the gross profits you derive from the use of Project Gutenberg™ works calculated using the method you already use to calculate your applicable taxes. The fee is owed to the owner of the Project Gutenberg™ trademark, but he has agreed to donate royalties under this paragraph to the Project Gutenberg Literary Archive Foundation. Royalty payments must be paid within 60 days following each date on which you prepare (or are legally required to prepare) your periodic tax returns. Royalty payments should be clearly marked as such and sent to the Project Gutenberg Literary Archive Foundation at the address specified in Section 4, “Information about donations to the Project Gutenberg Literary Archive Foundation.”
- You provide a full refund of any money paid by a user who notifies you in writing (or by e-mail) within 30 days of receipt that s/he does not agree to the terms of the full Project Gutenberg™ License. You must require such a user to return or destroy all copies of the works possessed in a physical medium and discontinue all use of and all access to other copies of Project Gutenberg™ works.

- You provide, in accordance with paragraph 1.F.3, a full refund of any money paid for a work or a replacement copy, if a defect in the electronic work is discovered and reported to you within 90 days of receipt of the work.
- You comply with all other terms of this agreement for free distribution of Project Gutenberg™ works.

1.E.9. If you wish to charge a fee or distribute a Project Gutenberg™ electronic work or group of works on different terms than are set forth in this agreement, you must obtain permission in writing from the Project Gutenberg Literary Archive Foundation, the manager of the Project Gutenberg™ trademark. Contact the Foundation as set forth in Section 3 below.

#### 1.F.

1.F.1. Project Gutenberg volunteers and employees expend considerable effort to identify, do copyright research on, transcribe and proofread works not protected by U.S. copyright law in creating the Project Gutenberg™ collection. Despite these efforts, Project Gutenberg™ electronic works, and the medium on which they may be stored, may contain “Defects,” such as, but not limited to, incomplete, inaccurate or corrupt data, transcription errors, a copyright or other intellectual property infringement, a defective or damaged disk or other medium, a computer virus, or computer codes that damage or cannot be read by your equipment.

1.F.2. LIMITED WARRANTY, DISCLAIMER OF DAMAGES - Except for the “Right of Replacement or Refund” described in paragraph 1.F.3, the Project Gutenberg Literary Archive Foundation, the owner of the Project Gutenberg™ trademark, and any other party distributing a Project Gutenberg™ electronic work under this agreement, disclaim all liability to you for damages, costs and expenses, including legal fees. YOU AGREE THAT YOU HAVE NO REMEDIES FOR NEGLIGENCE, STRICT LIABILITY, BREACH OF WARRANTY OR BREACH OF CONTRACT EXCEPT THOSE PROVIDED IN PARAGRAPH 1.F.3. YOU AGREE THAT THE FOUNDATION, THE TRADEMARK OWNER, AND ANY DISTRIBUTOR UNDER THIS AGREEMENT WILL NOT BE

LIABLE TO YOU FOR ACTUAL, DIRECT, INDIRECT, CONSEQUENTIAL, PUNITIVE OR INCIDENTAL DAMAGES EVEN IF YOU GIVE NOTICE OF THE POSSIBILITY OF SUCH DAMAGE.

1.F.3. LIMITED RIGHT OF REPLACEMENT OR REFUND - If you discover a defect in this electronic work within 90 days of receiving it, you can receive a refund of the money (if any) you paid for it by sending a written explanation to the person you received the work from. If you received the work on a physical medium, you must return the medium with your written explanation. The person or entity that provided you with the defective work may elect to provide a replacement copy in lieu of a refund. If you received the work electronically, the person or entity providing it to you may choose to give you a second opportunity to receive the work electronically in lieu of a refund. If the second copy is also defective, you may demand a refund in writing without further opportunities to fix the problem.

1.F.4. Except for the limited right of replacement or refund set forth in paragraph 1.F.3, this work is provided to you 'AS-IS', WITH NO OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PURPOSE.

1.F.5. Some states do not allow disclaimers of certain implied warranties or the exclusion or limitation of certain types of damages. If any disclaimer or limitation set forth in this agreement violates the law of the state applicable to this agreement, the agreement shall be interpreted to make the maximum disclaimer or limitation permitted by the applicable state law. The invalidity or unenforceability of any provision of this agreement shall not void the remaining provisions.

1.F.6. INDEMNITY - You agree to indemnify and hold the Foundation, the trademark owner, any agent or employee of the Foundation, anyone providing copies of Project Gutenberg™ electronic works in accordance with this agreement, and any volunteers associated with the production, promotion and distribution of Project Gutenberg™ electronic works, harmless from all liability, costs and expenses, including legal fees, that arise directly or indirectly from any of the following which you do or cause

to occur: (a) distribution of this or any Project Gutenberg™ work, (b) alteration, modification, or additions or deletions to any Project Gutenberg™ work, and (c) any Defect you cause.

## **Section 2. Information about the Mission of Project Gutenberg™**

Project Gutenberg™ is synonymous with the free distribution of electronic works in formats readable by the widest variety of computers including obsolete, old, middle-aged and new computers. It exists because of the efforts of hundreds of volunteers and donations from people in all walks of life.

Volunteers and financial support to provide volunteers with the assistance they need are critical to reaching Project Gutenberg™'s goals and ensuring that the Project Gutenberg™ collection will remain freely available for generations to come. In 2001, the Project Gutenberg Literary Archive Foundation was created to provide a secure and permanent future for Project Gutenberg™ and future generations. To learn more about the Project Gutenberg Literary Archive Foundation and how your efforts and donations can help, see Sections 3 and 4 and the Foundation information page at [www.gutenberg.org](http://www.gutenberg.org).

## **Section 3. Information about the Project Gutenberg Literary Archive Foundation**

The Project Gutenberg Literary Archive Foundation is a non-profit 501(c)(3) educational corporation organized under the laws of the state of Mississippi and granted tax exempt status by the Internal Revenue Service. The Foundation's EIN or federal tax identification number is 64-6221541. Contributions to the Project Gutenberg Literary Archive Foundation are tax deductible to the full extent permitted by U.S. federal laws and your state's laws.

The Foundation's business office is located at 809 North 1500 West, Salt Lake City, UT 84116, (801) 596-1887. Email contact links and up



to date contact information can be found at the Foundation's website and official page at [www.gutenberg.org/contact](http://www.gutenberg.org/contact)

## **Section 4. Information about Donations to the Project Gutenberg Literary Archive Foundation**

Project Gutenberg™ depends upon and cannot survive without widespread public support and donations to carry out its mission of increasing the number of public domain and licensed works that can be freely distributed in machine-readable form accessible by the widest array of equipment including outdated equipment. Many small donations (\$1 to \$5,000) are particularly important to maintaining tax exempt status with the IRS.

The Foundation is committed to complying with the laws regulating charities and charitable donations in all 50 states of the United States. Compliance requirements are not uniform and it takes a considerable effort, much paperwork and many fees to meet and keep up with these requirements. We do not solicit donations in locations where we have not received written confirmation of compliance. To SEND DONATIONS or determine the status of compliance for any particular state visit [www.gutenberg.org/donate](http://www.gutenberg.org/donate).

While we cannot and do not solicit contributions from states where we have not met the solicitation requirements, we know of no prohibition against accepting unsolicited donations from donors in such states who approach us with offers to donate.

International donations are gratefully accepted, but we cannot make any statements concerning tax treatment of donations received from outside the United States. U.S. laws alone swamp our small staff.

Please check the Project Gutenberg web pages for current donation methods and addresses. Donations are accepted in a number of other ways including checks, online payments and credit card donations. To donate, please visit: [www.gutenberg.org/donate](http://www.gutenberg.org/donate)

## **Section 5. General Information About Project Gutenberg™ electronic works**

Professor Michael S. Hart was the originator of the Project Gutenberg™ concept of a library of electronic works that could be freely shared with anyone. For forty years, he produced and distributed Project Gutenberg™ eBooks with only a loose network of volunteer support.

Project Gutenberg™ eBooks are often created from several printed editions, all of which are confirmed as not protected by copyright in the U.S. unless a copyright notice is included. Thus, we do not necessarily keep eBooks in compliance with any particular paper edition.

Most people start at our website which has the main PG search facility: [www.gutenberg.org](http://www.gutenberg.org).

This website includes information about Project Gutenberg™, including how to make donations to the Project Gutenberg Literary Archive Foundation, how to help produce our new eBooks, and how to subscribe to our email newsletter to hear about new eBooks.